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Head motion and Head gesture Based Control Robot

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Abstract: This project deals with the gesture based control robot. ***The robot performs four basic recognised head gestures: nodding down, nodding up, bending left and bending right. They were used as basic interaction elements to switch between control groups and to enable or disable robot controls. It is controlled using MATLAB programs like Viola Jones algorithm and is segmented with activity based windowing. The basic application used for these type of controls is robotic where the robot head would be able to make contact with a human.***

I. INTRODUCTION

A robot is a machine usually designed to reduce human efforts and to help them in performing complex tasks. It can be controlled by external device or can be programmable. Robotics is a branch of technology that deals with the design, construction, operation and function of the robot. They can be controlled by humans without moving an inch from their place by their gestures. Gesture recognition is a subject in software engineering and dialect innovation with the objective of translating human gestures by means of scientific calculations. Gestures can begin from any movement but usually begins from face or head like nodding up or down or moving the hand left and right. The robot control by gestures can be controlled by using MATLAB program which is installed in the laptop/computer that exploits sensor information.

II. LITERATURE REVIEW

Previously robots were controlled through hand operators which limited the interactions with the humans. So, vision based techniques was used to overcome this difficulty. Now, it only requires videos cameras for gesture recognition[1] and a computer based application such as Viola Jones algorithm. When we were able to control the robot through gestures instead of human operators, it became more easier for more people to use[2] and people on large scale would have the access to hands free robot. Usually gesture controlled robot or hands free robot is most useful for disabled people who are unable to move[3]. With the introduction of hands free robot to the disabled people, they did not have to rely on other people for basic things such as moving their wheelchair from one place to another, or helping them to stand and making them eat, it provided new opportunities for the disabled people to be independent of other people. The hands free robot works on the process of image processing. In image processing, a camera, attached to the computer, captures the image and then compares it with static image to find the position of gesture[4]. It even helped disabled people to (re)integrate into working life and help them live a normal life[5]. The gesture free robot refers to basic human movement such as moving of hands, rotating the head, swinging the body. The three main techniques to extract human motion are: visual analysis, inertial sensors and bio-signals[6]. Through physical devices the robots are controlled. But, recently the trends have allowed the optimization of the controlling systems in image processing[7]. The hands free robot is controlled manually, by user gestures[8] without any kind of wires, joysticks or buttons.

A. Components used

1) *Arduino Uno:* It is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started
2) *Servo Motor:* It is a rotary actuator which allows explicit control of linear position, velocity and acceleration. For the position feedback, a suitable motor is coupled to a sensor. It requires a dedicated module designed specifically for servo motor
3) *USB Webcam:* A video camera which provides the computer with live image or in real time image is a webcam. The video streamed through webcam can be saved, viewed or sent onto other networks via internet and e-mail attachments when captured by the computer. Also, video streamed can be saved, viewed or on sent there once it is sent to remote location. A webcam is

easy to use as it is generally connected by a USB cable or built into computer hardware such as laptops, unlike IP cameras which can only be connected with Ethernet or Wi-Fi.

III. METHODOLOGY

A. *Detection*

The first step towards the gesture based control robot is detection. In detection, the human face is detected by the webcam connected to the laptop/computer. The video is then divided into frames and each frame for the face. The first stage for face detection is detected by MATLAB. In MATLAB, the Viola the coordinates which are obtained after face detection for each frame is written onto the arduino microcontroller.

B. *Tracking*

The arduino microcontroller is used to do the face tracking. Its applications can be done with hardware and software as it is an open platform for both. The microcontroller is linked with two servo motors before starting tracking the servos are centered. The face tracking in subsequent frames is done with the help of the co-ordinates acquired from bounding box. The movements of the webcam mounted on it is controlled by motors. As the movement of the object or person changes the webcam changes it's movements with it. The range of postion in servo motors varies from 0 to 180 degrees.

IV. RESULTS AND ANALYSIS

After many hit and trials over the hardware and the programming, the robot was not able to function properly. We then started to make some changes in the program in MATLAB and finally the robot was able to move with the movement of the head. The details of few trials are given as follows:

A. Trail l: The servo motor could not move with the movement of the head.
B. Trial 2: It could move only horizontally and vertically.
C. Trial 3: Some success. The servo motor moved horizontally, vertically, up and down with the movement of the head.

V. CONCLUSION AND FUTURE SCOPE

In this project, an innovative technique of gesture based control robot has been introduced. All the components used are cost effective and compact. With the help of this technique, the human effort would be reduced to large extent especially for those who cannot move from their seats.

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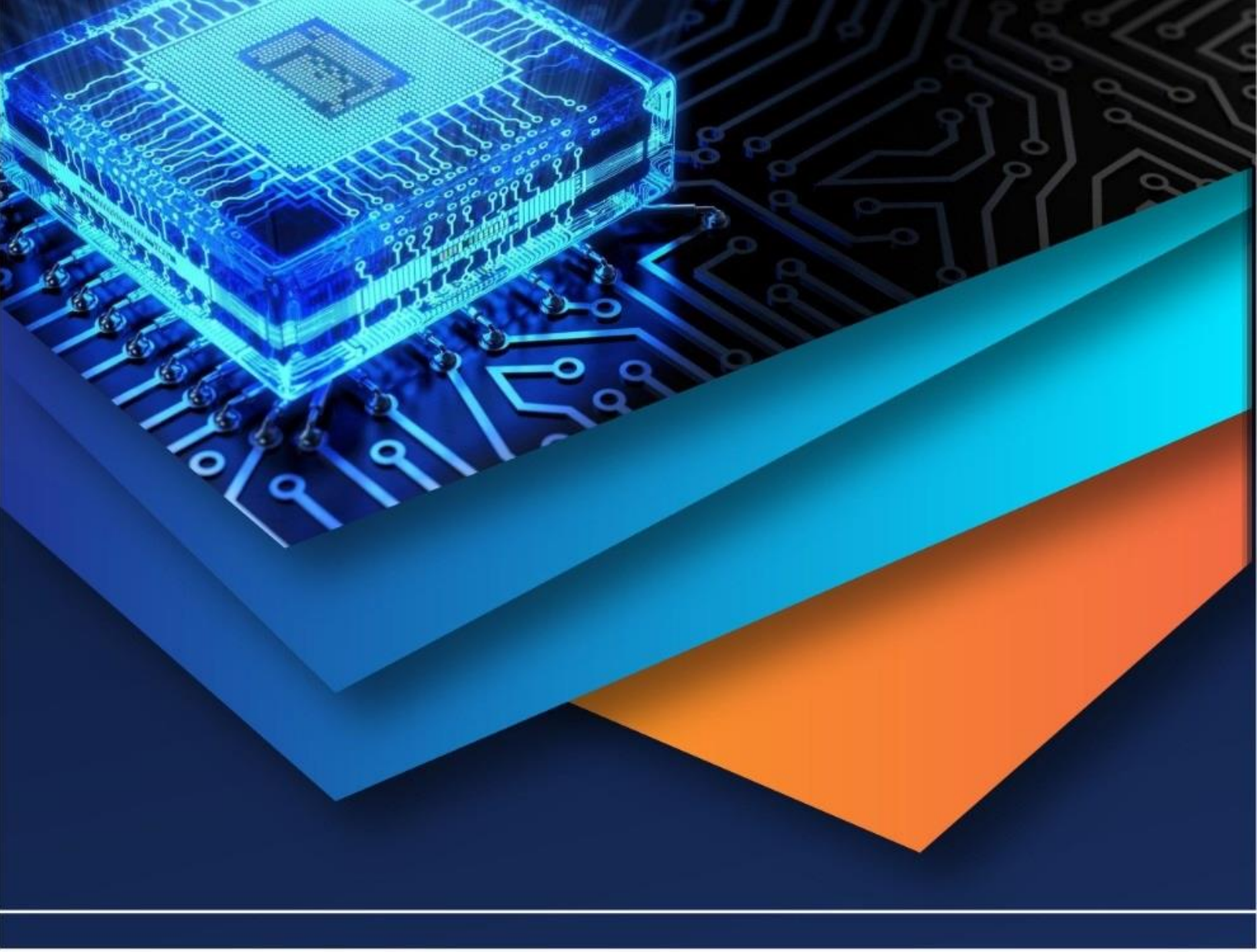

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